Bendix™ BackSpotter® Rear Collision Warning System

User / Installation Guide

Bendix™ BackSpotter® Rear Collision Warning System

BW2768 (Formerly VODR0038)

May 2010

General Information

Warnings and Cautions

⚠ WARNING

Improper use of this system could lead to a serious accident. Read this entire Operating Manual/Installation Guide before operating the Bendix™ BackSpotter® system. Pay particular attention to the safety messages below. This manual should be used in conjunction with proper training.

Limitations of Collision Warning Systems

The Bendix™ BackSpotter® rear collision warning system is intended solely as an aid for an alert and conscientious professional driver. It is not to be used or relied upon to operate a vehicle. The system should be used in conjunction with rear view mirrors and other instrumentation to maintain safe operation of the vehicle, ground personnel, and adjacent property. A vehicle equipped with the Bendix™ BackSpotter® system should be operated in the same safe manner as if the system were not installed. The system is not a substitute for normal safe driving procedures. It will not compensate for any driver impairment, such as drugs, alcohol, or fatigue. Should the system become inoperative, it could jeopardize the safety or lives of those who depend on the system for safety.

⚠ WARNING

The system will not sense objects if the sensor view is obstructed. Therefore, do not place objects in front of the system sensor. Remove heavy buildups of mud, dirt, ice, and other materials.

Proper alignment is critical to correct operation of the system.

Testing and inspection of the system in accordance with these instructions and record of the results should be listed on the daily maintenance report. The units on operating vehicles must be tested each day (see the "Testing and Maintenance" section) prior to the vehicle's operation. Results of this test must be recorded in the maintenance log.

People operating this equipment MUST check for proper operation at the beginning of every shift or safety inspection period.

⚠ WARNING

People's lives depend on the proper installation of this product in conformance with these instructions. It is necessary to read, understand, and follow all instructions shipped with the product.

Failure to follow all safety precautions and instructions may result in property damage, serious injury, or death.

The Bendix™ BackSpotter® system is intended for commercial use. Proper installation of this system requires a good understanding of truck electrical systems and procedures, along with proficiency in the installation.

Store these instructions in a safe place and refer to them when maintaining and/or reinstalling the product.

Table of Contents

Warnings and Cautions i
Federal Communications Commission 1
Product Description 2
System Operation 5
Object Detection Capability 6
Installation 8
Troubleshooting 16
Specifications 18
Limited Warranty 19
Maintenance 20

FCC Compliance

Federal Communications Commission

This device complies with Part 15 of the FCC (Federal Communications Commission) rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference and (2) this device must be able to accept any interference received, including interference that may cause undesired operation. Any interference that may be caused should be reported to the local FCC field office or to the Federal Communications Commission; Enforcement Bureau; 445 12th Street S.W.; Room 7-C485; Washington, DC 20054.

⚠ WARNING

Any changes or modifications made by the user to this equipment that are not expressly approved by Bendix Commercial Vehicle Systems LLC could void the user's authority to operate the equipment.

Every effort has been made to ensure the accuracy of all information in this brochure. However, Bendix Commercial Vehicle Systems LLC makes no expressed or implied warranty or representation based on the enclosed information. Errors or omissions should be reported to: Bendix Commercial Vehicle Systems LLC, 901 Cleveland Street, Elyria, OH 44035 or 1-800-AIR-BRAKE (1-800-247-2725).

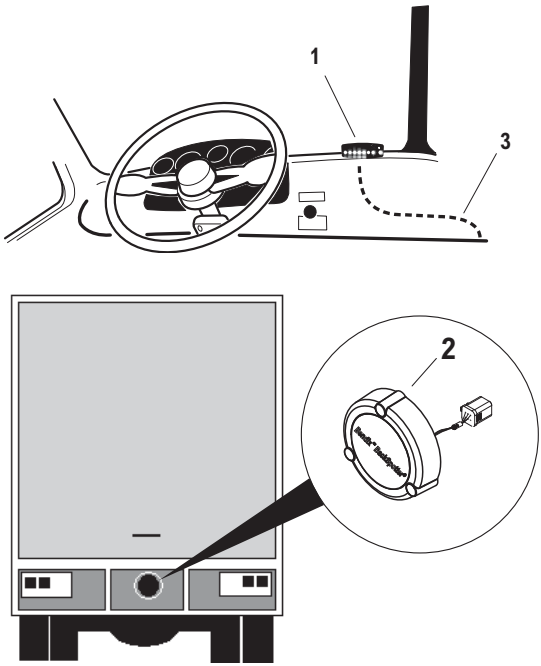
Operation

Product Description

The Bendix™ BackSpotter® system is a standalone vehicle radar system specifically designed to alert a driver to objects behind the vehicle when the vehicle's transmission is placed in reverse. The system detects both moving and stationary objects in a pre-defined coverage area and warns the driver via visual indicators and audible warning tones. The system is designed to supplement other safety practices and is not to be the sole method of collision avoidance.

The Bendix™ BackSpotter® system consists of three components:

1. Rear sensor display mounted in the vehicle cab
2. Pulse-modulated rear mounted radar sensor
3. Interconnect harness



Rear Sensor Display

The rear sensor display provides the driver with both visual and audible warnings with the use of five (5) LED indicators and audible warning tones from the built in speaker.

A volume control button on the front right of the rear sensor display allows the driver to adjust the audible signal to three different audible levels (Low, Medium, and High).

An ambient light sensor on the front of the rear sensor display automatically dims the intensity of the LEDs (light emitting diodes) in low light conditions.

In the event the system detects a failure, the rear sensor display will continuously "flash" all five LED indicators, as well as an audible warning signal. See the "Troubleshooting" section in this manual for more information.

Operation

Sensor Description

The radar sensor transmits and receives a low power 5.8 GHz radar signal. It processes the returned signal to determine if an object is within the detection area and reports this to the driver via the rear sensor display. The sensor's fast response time allows the driver to respond to dangerous situations immediately.

The sensor has a maximum detection zone depth of approximately 15 feet (5 meters) from the face of the sensor. When the radar sensor detects an object within its detection zone, a signal is sent from the sensor to the rear sensor display to warn the driver of a potential collision.

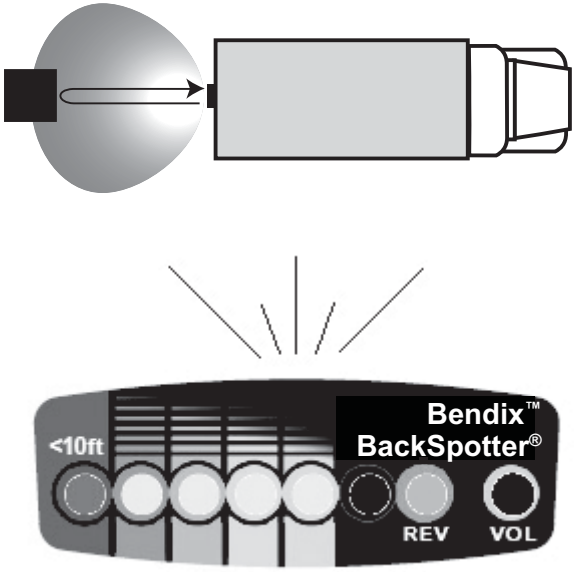
The table below shows how object detection is report to and displayed by the rear sensor display from the sensor.

Condition	LED1	LED2	LED3	LED4	LED5	Speaker	Distance from Object*
No Object Detected	off	off	off	off	off	off	More than 15'
Object Detected	off	off	off	off	on	1Hz beep	Less than 15'
Object Detected	off	off	off	on	on	1Hz beep	
Object Detected	off	off	on	on	on	2Hz beep	
Object Detected	off	on	on	on	on	4Hz beep	
Object Detected	on	on	on	on	on	8Hz beep	Less than 10'

*Approximate distance

System Operation

When the vehicle's transmission is placed in reverse, the system will power up and the rear sensor display will go through a quick self-test by momentarily flashing all LEDs. When the system is operating correctly in an open field with no obstructions, the green power LED will be the only light illuminated. If any or all of the detection (yellow) LEDs are lit and a warning tone is heard, stop the vehicle and check for any objects behind the vehicle being detected by the sensor.

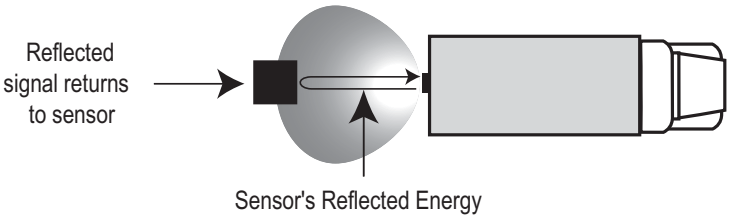


Operation

Object Detection Capability

Because of the characteristics of radar, some objects may be detected at a greater distance than others. Obstacle size, shape, and composition are all factors determining when an object is detected.

The Bendix™ BackSpotter® system operates by transmitting a pulse of very low power electromagnetic energy. Any energy that strikes an object reflects a certain amount of this energy back to the sensor. This returned energy is measured to determine the object's presence and distance.

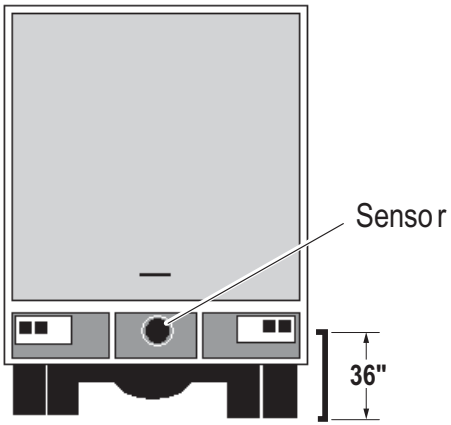


The amount of energy an object reflects is determined by several factors:

- Size of the object.
- Composition - A metal object reflects more energy than a non-metallic object.
- Scattering - A solid object reflects more energy than a non-solid object such as wood, gravel, bushes, etc.
- Angle - An object perpendicular to the sensor will reflect more energy than an object at an angle.

Radar Sensor Location

The Radar Sensor mounting location is key to proper system operation. Ideally, the Sensor should be centered on the rear of the vehicle at roughly 36" (1 m) ±12" (.3 m) from the ground, and should be a minimum of 5/16" out further than other surfaces on the back of the vehicle (frame, bumper, box, etc.) to reduce the possibility of interference with the sensor's operation. The mounting location should protect the sensor from impact when backing up to a dock, as well as, providing an unobstructed view of the rear of the vehicle. The sensor face should also be perpendicular to the ground.



⚠ WARNING

Before permanently installing the sensor to the vehicle, check to be sure the area you selected to mount the sensor provides a clear detection zone. Temporarily attach the sensor in the proposed mounting location, apply power to the system, and verify nothing is being detected.

Installation

Sensor Installation

1. Select the appropriate sensor mounting location using the mounting bracket supplied.
2. The sensor must be mounted with the “Bendix logo” parallel to the ground.
3. If mounting the sensor directly to the chassis or on a custom bracket, use the sensor’s mounting holes as a template and score position marks through the holes. Drill 1/4" (6 mm) holes centered at the marks.
4. Secure the sensor to the vehicle with the supplied 10-24 UNC button head screws, washer, and nuts (or equivalent). **Torque mounting screws 22 lbs. in. max.**

Rear Sensor Display Installation

The rear sensor display should be mounted where it can be easily viewed and heard by the operator while backing up the vehicle. Recommended mounting locations are on the dashboard in front of the driver, or on the driver side windshield pillar.

The rear sensor display should not obstruct the driver’s view, or interfere with the vehicle’s normal operation.

The rear sensor display comes equipped with a mounting bracket and hardware. The rear sensor display is not watertight and should be mounted inside the vehicle cab.

Harness Installation

Use the corrugated loom provided in the installation kit to wrap the harness before installing. Care should be taken to not route the interconnect harness next to heat sources such as the engine exhaust, or areas that may expose the harness to abrasion, strain or damage. Allow for a small service loop in the harness at the sensor and secure the harness every one or two feet (30 to 60 mm) with tie wraps or harness tape. Use the grommet provided to protect the harness when passing through the cab wall (if required).

Harness Extension

The interconnect harness provided is 40 feet (14 meters) long, from sensor to rear sensor display. Additional 20-foot (7 meter) extensions can be purchased for applications requiring additional length (P/N 41365-100).

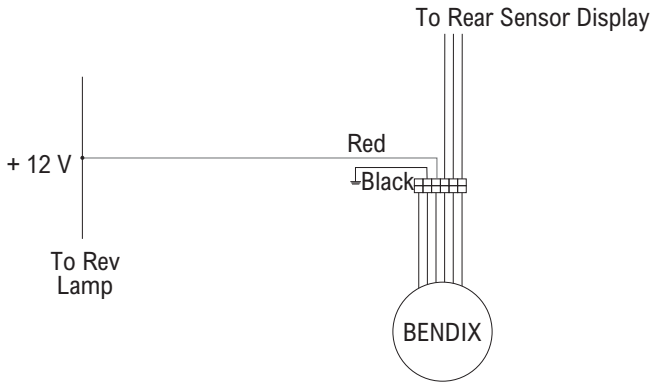
Radar Sensor Power Connection

Locate the vehicle's reverse light power source and connect to the red power wire on the sensor harness using 18 AWG wire. Connect the black ground wire of the sensor harness to the vehicle ground.

The sensor should only have power when the transmission is in reverse.

Interconnection Table

Harness Lead	Vehicle Connection
Red	Connect to Reverse Lamp Power (+12 v)
Black	Connect to Vehicle Chassis Ground



Installation

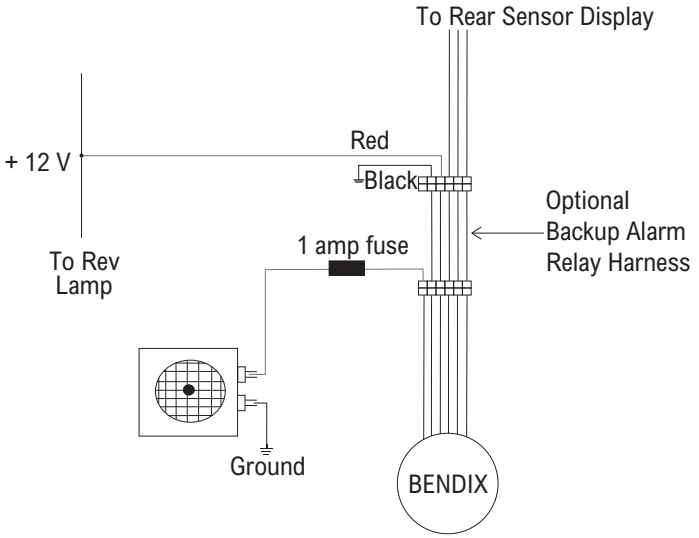
Backup Alarm Control Feature (optional harness required)

The Bendix™ BackSpotter® sensor has a built-in relay output that can control a backup alarm, or any low current 12-volt device, whenever an object is detected. This feature allows the backup alarm to remain silent when the vehicle is in reverse, unless an object is present in the sensor's detection zone.

The normally off output is tied to ground when the sensor is off, or no objects are present. When the sensor is energized and detects an object, the built in relay switches the output to +12 volts, providing power to the backup alarm via the fused relay out harness lead.

An optional relay out harness is required to connect the backup alarm to the Bendix™ BackSpotter® sensor (P/N 41371-100). The relay out harness is equipped with an inline 1-amp fuse, which protects the sensor from excess load current.

DO NOT USE A FUSE IN EXCESS OF 1 AMP.



Initial System Power-Up

Once the Bendix™ BackSpotter® system is installed, power should be applied to test correct system operation. Upon power-up, the driver display unit will go through a self-test by flashing all LEDs. When the system is operating correctly in an open field with no obstructions, the green power LED will be the only light illuminated. If any/all of the detection (yellow) LEDs are lit, check for any obstruction which may be detected by the sensor.

If the system is malfunctioning, all of the LEDs (yellow and green) will be flashing and the buzzer will be sounding.

Function Test

1. Before testing the sensor, make sure the sensor has a clear view of sight. The recommended test area is 18 ft. (6 m) wide by 18 ft. (6 m) deep from the rear of the vehicle.
2. Park the vehicle on a level surface. Block the wheels and keep the parking brakes applied at all times.
3. Power up the Bendix™ BackSpotter® system by turning the vehicle ignition to on (DO NOT START THE ENGINE) and placing the vehicle's transmission in reverse.

⚠ WARNING

If it is necessary to start the engine to place the transmission in reverse, turn the engine off before testing the sensor. NEVER allow someone behind the vehicle while the engine is running and the transmission is in reverse.

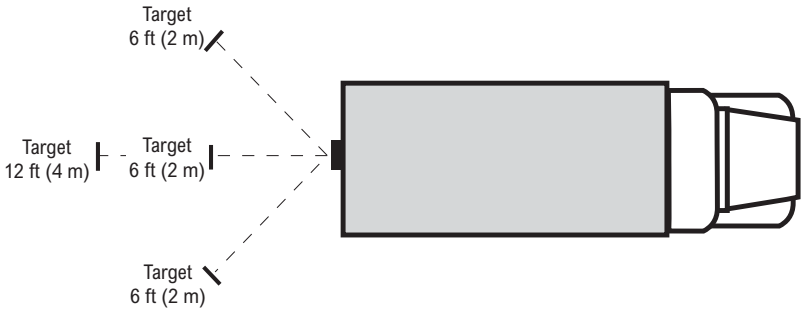
4. Verify the green LED on the rear sensor display is on and the unit indicates NO objects are detected. If the display indicates object detection, make sure the area around the sensor is clear and the sensor mounting is appropriate.
5. Have an assistant test the sensor detection by holding a metallic test target (minimum 10 in. x 10 in. [25 cm x 25 cm]) 6 ft. (2 m) from the sensor. Keeping the target aimed directly at the sensor, move 6 ft. (2 m) to the left and then 6 ft. (2 m) to the right, verifying that the sensor detects the target all three locations. (See the illustration on the next page.)

6. Finally, hold the test target 12 ft. (4 m) from the center of the vehicle rear, aiming the target directly at the sensor. Verify the sensor can detect the target at this location.

Note: The rear sensor display may not illuminate all 5 LEDs for a target 12 ft. (4 m) away.

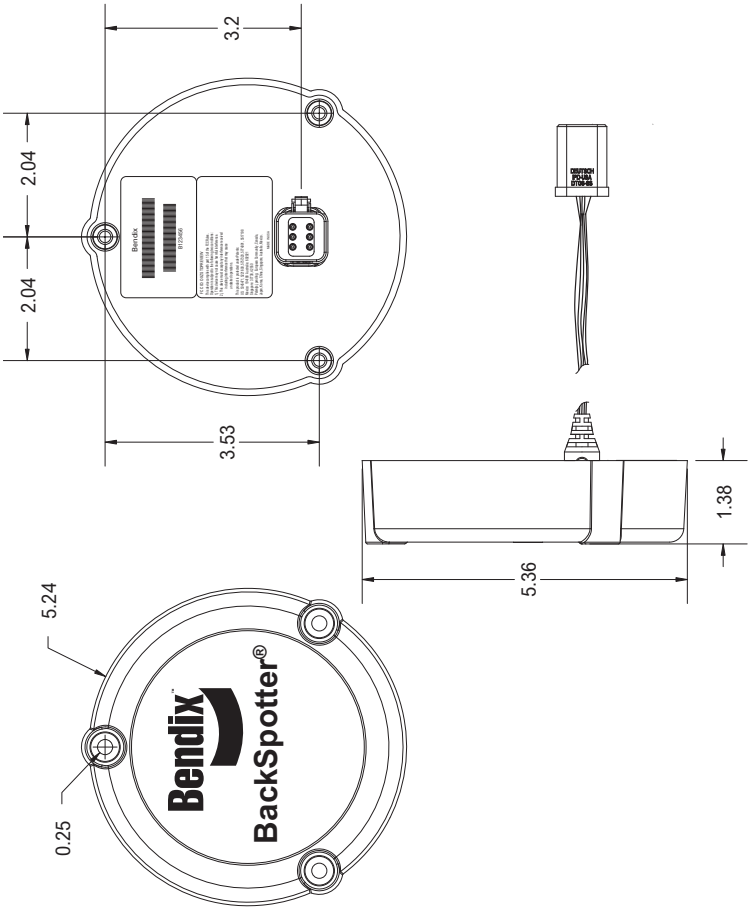
For maximum energy reflection when testing the sensor, keep the face of the test target aimed directly at the sensor. The pattern below indicates the sensor's maximum detection capability and is for testing only. The sensor may not detect all objects at these angles.

The sensor's ability to detect depends on the composition of the target at its ability to reflect pulse radar energy. The sensor may not detect humans, wood, or other non-metallic objects within the sensor's detection zone.



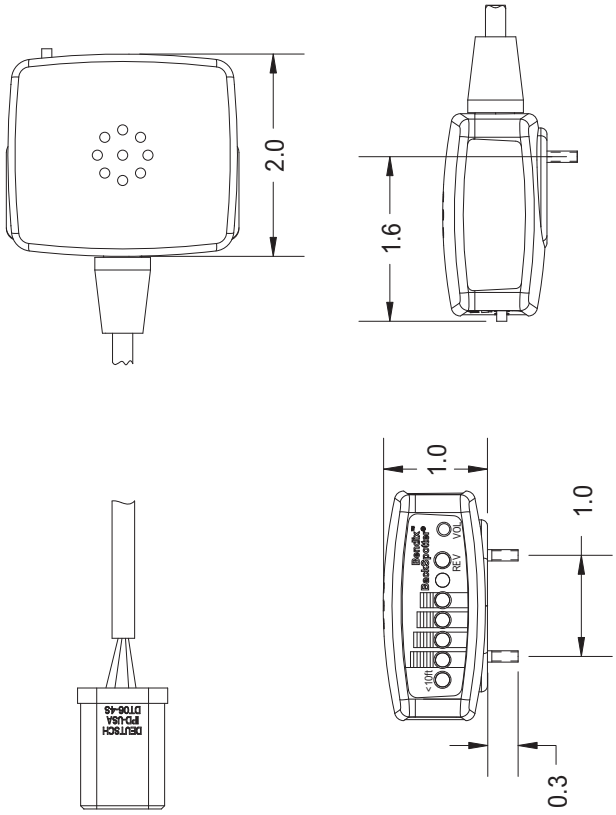
Diagrams

Radar Sensor

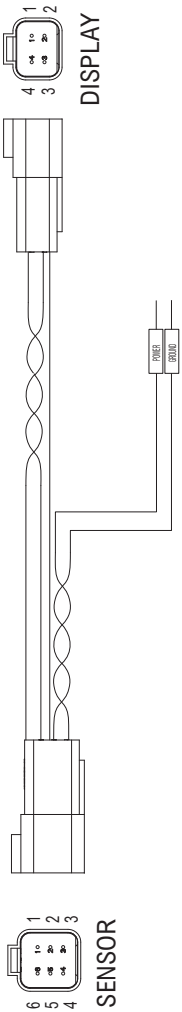


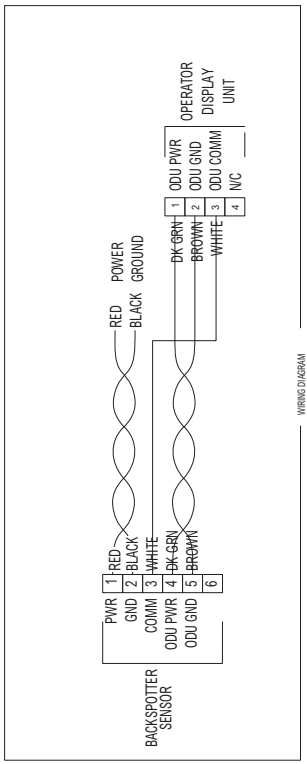
Installation

Rear Sensor Display



Interconnect Harness





Troubleshooting

⚠ WARNING

The vehicle's ignition must be on and the transmission in reverse for the Bendix™ BackSpotter® system to power up. When testing and troubleshooting the system, make sure (1) the ENGINE IS OFF, (2) the truck is in park on a level surface, and (3) the parking brakes are properly set.

The Bendix™ BackSpotter® system has built-in self test diagnostics and will warn the driver if the system detects a failure within the radar sensor. In the event the system self-test detects a failure, all five of the LEDs on the rear sensor display will flash along with a warning tone.

The following are typical symptoms and the possible causes:

All five LEDs on the rear sensor display unit are flashing.

- The self-test has detected a failure within the radar sensor.
- Inspect the radar sensor for proper mounting, debris buildup, or damage.
- Inspect the wiring harness for damage or corrosion.

The green power LED on the rear sensor display does not illuminate when the vehicle is placed in reverse.

- The Bendix™ BackSpotter® system is not powering up.
- Check for power to the reverse lamp circuit.
- Check the Bendix™ BackSpotter® harness power connections, inspect for damage or corrosion.
- Check for battery power at pin 1(+) and pin 2(-) at harness connector J1 (sensor).
- Check for system power (+5VDC) at pin 1(+) and pin 2(-) at harness connector J2 (rear sensor display).

Troubleshooting

One or more warning LEDs remain on and a tone is heard, but there are not objects behind the vehicle.

- Inspect the radar sensor for proper mounting, debris buildup, or damage.

- Check for suspended objects or overhead clearances within a 15 feet radius of the radar sensor.

- Inspect the radar sensor for proper mounting. Verify the sensor is pointing outward from the vehicle in an open area with no obstructions in its view.

- If the sensor is detecting the ground, reposition the sensor higher on the vehicle, or at a slight upward angle (2 to 5 degrees). The minimum recommended height from the ground is 30 inches (75 mm).

The detection zone seems wider when detecting large objects like other vehicles, than when detecting smaller objects or people.

- This is normal since vehicles have a greater radar cross section than smaller objects, non-metallic objects, and people.

The interconnect harness to the rear sensor display is too short.

- Harness extensions can be purchased in 20-foot (7 meter) increments (P/N 41365-100).

The backup alarm does not sound when used with the (optional) relay out harness (P/N 41371-100).

- Verify the positive lead on the backup alarm is hooked to the 1 amp fused relay out harness lead and the negative lead is tied to the chassis ground.

- Check the 1 amp fuse in the relay out harness. **DO NOT use a fuse larger than 1 amp.**

Specifications

Specifications

Typical

Electronics	Solid state
Sealing	Encapsulated to protect from dust, moisture, and vibration.
Operating Temperature	-40°F to +185°F (-40°C to +85°C)
Sensor	Pulsed RF transmitter at 5.8 GHz
Material	Polycarbonate radome with aluminum back plate
Weight	1.75 lbs. (0.8 kg)
Dimensions	5.25" (13.3 cm) diameter x 1.25" (3.2 cm) deep
Mounting	3 - 0.188 (4.8 mm) diameter mounting holes
Rear Sensor Display	
Material	Polycarbonate / ABS alloy
Weight	.25 lbs. (.11 kg)
Dimensions	1.00" (2.5 cm) height x 2.25" (5.7 cm) width x 2.00" (5.1 cm) depth
Mounting	User dependent

Electrical

Input Voltage	9 - 33 volts DC
Input Current	0.25 amp maximum (1 amp maximum)
Polarity	Polarity protected
Power Connection	2 - 18 AWG wires

Regulatory Compliance

Compliant with	FCC Part 15.249 (5725-5875 MHz)
FCC ID	OXZSTDPREVIEW

Manufacturer Limited Warranty

Bendix warranty limits and guidelines can be found in the Roadranger Warranty Guide (TCWY-0900) and the Roadranger Warranty Manual (TCWY-0600). For additional information visit www.roadranger.com or call 1-800-AIR-BRAKE (1-800-247-2725).

Maintenance

The Bendix™ BackSpotter® is intended solely as an aid for an alert and conscientious professional driver. A walk around test shall be performed every day to verify proper function of the system and to familiarize the operator with the zone detection. More frequent inspections should be performed when:

- The vehicle is operating in a particularly dirty or harsh environment.
- The operator has reason to suspect the system has been damaged.

Daily Maintenance Procedure

1. Clean the black sensor surface of any accumulation of dirt, mud, snow, ice or debris.
2. Visually inspect the attached wiring and cable and verify that they are properly secured, not chafing or dangling free where they could become snagged and damaged. Inspect the sensor and driver display unit to verify that they are securely attached to the vehicle.

⚠ WARNING

Vehicle brake must remain engaged to prevent injury.

3. Test system for proper operation. (See the Installation section under “Testing”.)

Bendix™

Roadranger®
The Roadranger® System features
Bendix® brand foundation brakes.

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